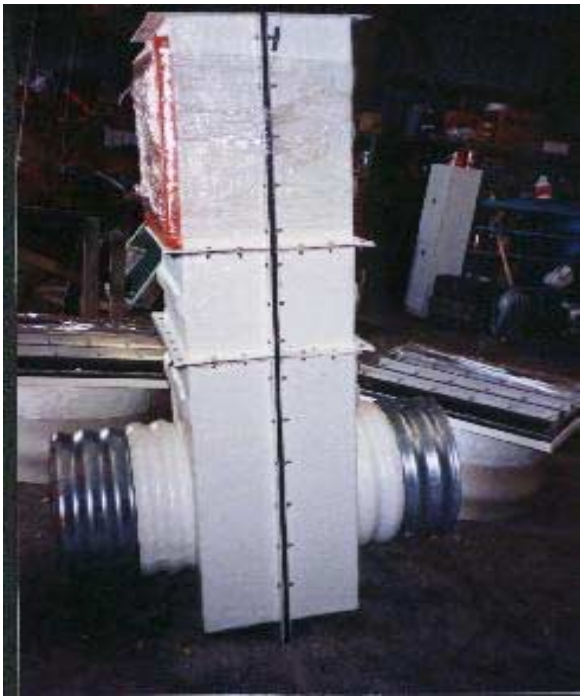
NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

DRAINAGE WATER MANAGEMENT (DWM)

(Acre)

CODE 554



DEFINITION

Control of water surface elevations and discharge from surface and subsurface drainage systems.

PURPOSES

Drainage water management is practiced as part of a conservation system to support one or more of the following purposes:

- Improve water quality by reducing nitrate loading to surface waters.
- Improve the soil environment for vegetative growth.
- Reduce the rate of soil organic matter oxidation.
- Reduce wind erosion.
- Enable seasonal soil saturation and/or shallow flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- A high water table exists, either naturally or induced.
- The topography is relatively smooth, uniform, and flat to gently sloping.
- A water table may be maintained without excessive seepage and without having an adverse impact on adjoining properties.
- The field has a subsurface drainage system; in Illinois, most subsurface drainage systems have been constructed with tile (plastic or clay).

CRITERIA

General Criteria Applicable to All Purposes

The system shall be designed to remove the water required for adequate drainage. The rate of outflow and the level of the water table shall be controlled by structures or pumps.

Structures or pumps shall be located where they are accessible and subject to convenient control. Designs of critical components shall be in accordance with pertinent NRCS Practice Standards.

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Water level control structure should be sized to provide adequate drainage flow and not to restrict drainage capacity.

The water level control structure shall be designed so as to allow the water table to rise to satisfy the intended purpose.

For subsurface systems, there should be at least 20 ft of solid drainage pipe installed with an anti-seep collar and connected to the control structure.

Additional Criteria to Improve Water Quality

The controlled discharge of excess water shall account for water not otherwise removed by evapotranspiration and seepage.

Drainage beyond that necessary to provide an adequate root zone for a crop shall be kept to a minimum. During fallow periods and when practicable, the water table shall be raised to the surface, or to a designated maximum elevation.

Additional Criteria to Improve Soil-Water Environment for Vegetative Growth

The water table shall be allowed to rise after planting so as to allow movement of water to the crop root zone by upflux (capillary action).

Additional Criteria to Reduce the Rate of Soil Organic Matter Oxidation

Drainage beyond that necessary to provide an adequate root zone for a crop shall be kept to a minimum. When practicable, the water table shall be raised to the surface, or to a designated maximum elevation, for a sufficient time to return the saturated zone to anaerobic conditions.

Additional Criteria to Reduce Wind Erosion

The system shall be operated to allow the water table to rise so as to provide sufficient moisture to the soil surface, either by ponding or upflux, to reduce wind erosion.

Additional Criteria to Enable Seasonal Soil Saturation and/or Shallow Flooding

The system shall be operated to allow surface soil saturation or shallow flooding for a sufficient time to accomplish the desired pest control, provide wildlife habitat, and/or reduce the rate of soil organic matter oxidation.

CONSIDERATIONS

The concept of drainage water management is based on the premise that the same drainage intensity is not required at all times during the year.

The management of field water table elevations and drainage discharges from subsurface drainage systems should be performed to maximize crop yield and minimize water quality impacts

The effect of managing the drainage system on adjacent fields should be evaluated. The installation and operation of a water level control structure should not impact adjacent fields or drainage systems.

In order for the practice to be economical and practical, each control structure needs to influence a significant amount of the field; therefore, drainage water management is generally limited to very flat fields with slopes typically less than 0.5 percent. It is possible to apply the practice on very moderate slopes if the tile system is designed with the laterals on the contour and a series of control structures are installed to step down the control elevations. This increases both drainage system cost and management.

Raising the water table during the growing season will generally increase evapotranspiration and may increase crop yield. Care must be practiced to maintain sufficient aerated crop root zone so as not to do damage to the crop.

Drainage water management may affect the water budget, especially volumes and rates of runoff, infiltration, evaporation, transpiration, possible deep percolation and ground water recharge because of the increase in the amount of water stored in the field.

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Drainage water management may increase base flow because of increased gradient from fields to surface water conduits. Higher field water tables may also increase deep seepage and lateral losses since this water will pass through reduced (low oxygen) zones it will be somewhat denitrified before leaving the field.

Drainage water management may increase runoff, which would reduce tile flow and lower nitrate loading to surface water. Runoff generally has a lower concentration of nitrate than tile flow water.

Drainage water management may increase runoff, which could increase movement of suspended sediment and attached substances.

Avoid traffic on finer textured wet soils to minimize soil compaction.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard as necessary and shall describe the requirements for applying the practice to achieve its intended use (see attached job sheet - standard drawing IL-ENG-178 is shown as an example).

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that will define the intended purposes of this practice and that will identify critical dates and target elevations of the water level necessary to accomplish the intended purposes. The plan shall also include the operation and maintenance of critical components of the infrastructure used to manage the drainage water and should address the following objectives as applicable.

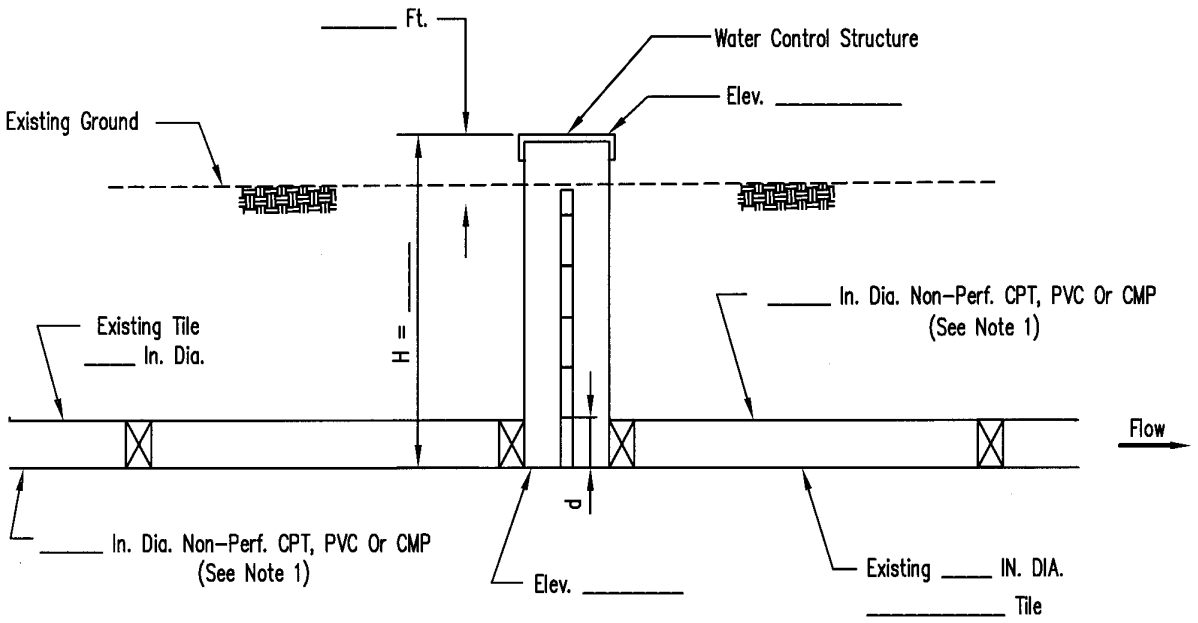
1. Prior to tillage, harvest, and other field operations, the water table should be at a depth to provide trafficability throughout the field.
2. After planting and other necessary field operations, the water table control device can be set to allow infiltration from rainfall to bring the water table to the desired level to provide capillary water to the plant root zone. This will vary, depending on crop.
3. Operation of the water level control structure during the crop season should be such that prolonged saturation of the root zone does not occur.
4. During the fallow period, the control structure should be operated to allow the water table to rise to the soil surface or to a designated maximum control elevation.
5. Field water table observation wells should be installed and the water table levels observed as part of the operation plan.

REFERENCES

National Engineering Handbook, Part 650, Chapter 14, Water Management (Drainage)

National Engineering Handbook, Part 623, Chapter 2, Water Table Contribution

National Engineering Handbook, Part 624, Chapter 10, Water Table Control



CROSS SECTION

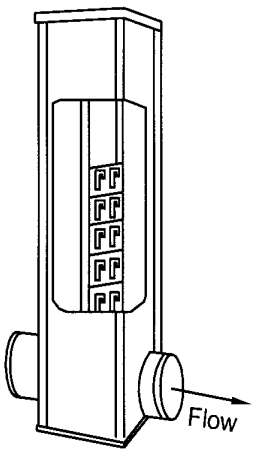
NOTES:

1. A minimum of 20 feet of non-perforated tile shall be installed adjacent the water control structure. The 20 feet may be upflow or downflow of the structure or a combination.
2. Coupling between the water control section and the non-perforated tile shall be water tight.

Materials Schedule Water Control Structure			
No	Width/Diameter (Inches)	H (Inches)	d (Inches)

Non Perforated___CPT Or ___PVC Or ___CMP	
(F+1)	Diameter (Inches)

Couplers	
No.	Diameter (Inches)



IN-LINE CONTROL STRUCTURE

IN-LINE CONTROL STRUCTURE WATER TABLE MANAGEMENT

Date
Designed
Drawn M. QUINONES 4/24/02
Checked
Approved

NRCS Natural Resources Conservation Service United States Department of Agriculture

File No. IL-ENG-178
Drawing No.
Sheet 1 of 1

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